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FOREST INSECT INVESTIGATIONS

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STUDIES OF *Ips confusus*

NORTHFORK, CALIFORNIA

1932

by

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STUDIES OF IPS CONFUSUS AT NORTHFORK, CALIFORNIA, 1932

Ips confusus, the five-spined engraver beetle, replaces Ips oregoni in the Sierra foothill region as the factor causing topkilling of ponderosa pine. In the abnormally dry year of 1924 Person noted at Cascadel that 89 out of 152, or 45% of the trees marked, were topkills caused by Ips confusus. The drought-weakened condition of the trees was considered as increasing the number of secondaries at that time.

In 1931 a much more serious infestation of Ips confusus took place. Just what course this infestation followed is not known. In 1929 a normal infestation by Dendroctonus brevicomis was running its course at Cascadel. In 1930 the area was not visited. By July of 1931 topkilling was fairly heavy throughout the Cascadel Basin. By the fall of 1931 the height of infestation had been reached. An early spring cruise in 1932 of the 1931 losses showed 494 topkills out of 843 infested trees on a half-section. Person's 89 topkills in 1924 covered about four sections, so the relative amounts of infestation are apparent.

The Cascadel infestation may be taken as indicative of the amount of damage done in 1931 by Ips confusus. The infestation by this insect took the shape of a band, 3,000 to 4,000 feet in elevation and extending from General Grant Park to Yosemite Park.

Ips confusus has habits similar to its near relative, Ips oregoni. The habit of Ips in general to rise suddenly to epidemic conditions in a single year and the next year nearly disappear from an area, is well known. Some time in 1932 was given to a study of what becomes of Ips in such cases.

In the early spring, during May, a number of trees which had been topkilled by Ips were climbed. In nearly all cases very little brood had been produced. The adults seemed to have attacked and extended irregularly shaped galleries without attempting to lay eggs in any considerable numbers. What brood had been produced seemed to encounter considerable difficulty in the way of excessive moisture. Evidently the unfavorable conditions within the trees attacked caused a very considerable reduction in the number of Ips during the winter months.

Very few of the trees which had been topkilled in the fall of 1931 by Ips were filled in by Ips at the base in 1932. There were a few exceptions, however, in the 4 to 6" diameter classes. A number of these smaller trees continued to fill in until about the middle of July, after which time no more could be located. In fact, from the middle of July to the first of November no standing trees could be located with developing Ips brood.

During May, June and July, Ips would fill in trap trees almost as soon as they were felled. After the middle of July traps either did not fill in at all or were but lightly attacked. This occurred on the same areas where hundreds of trees had been attacked the year before, so a very decided reduction in numbers must have taken place.

By the last part of October 1932 it was apparent that a considerable change in the trend of the infestation had taken place. Ips had been reduced to a very minor rôle, while buprestids were assuming importance. In order to check this 100 small topkills, 4 to 12 inches in diameter, were examined at random; 47 of these were still green at the base while 53 were filled in with buprestid larvae. No Ips were recorded. In addition to the smaller trees, a number of larger trees on the area were being attacked and killed by flathead borers.

Two groups of about ten trees each were at first thought to be new Ips killing. However, when representatives were cut down and the stems analyzed the cause of death was found to be buprestids only. No Ips were encountered.

Several different methods were attempted whereby it was hoped to follow the Ips through successive generations throughout the season. None of these was entirely successful. The failure to locate normally-attacked standing trees between the middle of July and the first part of November has already been mentioned. On November first two groups of Ips topkills were located containing brood in all stages. The overwintering record was lost, however, when the trees were cut and treated for Dendroctonus in the bases.

The accompanying Figure 1 shows a series of line graphs illustrating the development of Ips broods in trap trees from the first of May to the last of September. This divides roughly into three generations, viz.: (1) from the early part of May to the middle of June; (2) from the middle of June to the last part of July; and (3) from the first of August to the last part of September.

A single small tree located in a group of similar-sized reproduction was attacked and killed by Ips. This gave the idea that possibly Ips could be forced to attack one tree after another, and that thus one could study a succession of broods developing on green standing trees. With this in mind a cage four feet square and eight feet high was built around the base of an eight-inch tree. On May 28 the above-mentioned infested tree was cut into sections and placed within the cage. At this time many new adults were present. The brood in general was very good. The following chart shows the result of this caging experiment:

Date	Description
May 28	Caged 8" green tree; introduced number of brood logs containing numerous Ips broods in larval, pupal and new-adult stages; mostly new adults.
June 3	No attack; number of adults crawling about inside
7	No attack; placed three brood logs containing new adults just outside cage
15	Several Ips attacks noted just above cage
20	No further attacks; those above cage unsuccessful
27	No further attacks
July 5	No further attacks
11	No further attacks
13	Removed old brood logs and introduced six new ones containing Ips pupae and new adults, mostly new adults
20	No new attacks
25	No new attacks
Aug. 1	No new attacks
9	No new attacks
Mar.9/33	No new attacks

The above experiment ended in failure to induce Ips confusus to attack a pre-selected tree by caging an abundance of beetles at the base. Probably better results would have been obtained by attempting to cage the top of a tree, especially since the only attacks occurred above the cage.

Still another method was employed in an attempt to get successive generations of Ips confusus. This consisted of a four-foot-square screen cage in which were placed a number of brood logs. Green logs were then introduced. When the green logs were infested the brood logs were removed. The brood in the green logs was allowed to develop until a number of adults were noted crawling about inside the cage. These were re-emerged parent adults, because at this time the new brood had only just reached the pupal stage. The re-emerged parents were allowed to attack green logs, which were removed. The re-emerged parents produced a second brood, which reached the new-adult stage by August 10.

Soon after the re-emerged parents were removed the new adults began to emerge. These too produced a brood which matured into new adults about August 15. At this time the brood gave out, and no additional brood logs could be obtained (see Fig. 2).

Ips confusus very nearly disappeared from the Northfork area during the season of 1932. By fall buprestids had to a great extent assumed the rôle in which Ips had figured the previous fall. Why Ips should so nearly disappear from an area in which they had been very important but a year before is problematical. K.A. Salman advances the theory of a limited ecological range which is encountered in its optimum but rarely and then only for short periods.

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Bass Lake, Calif.,
May 15, 1933.

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Figure 2

DEVELOPMENT OF BROODS OF IPS CONFUSUS UNDER CAGE CONDITIONS - MONTROSE, CALIF., 1932

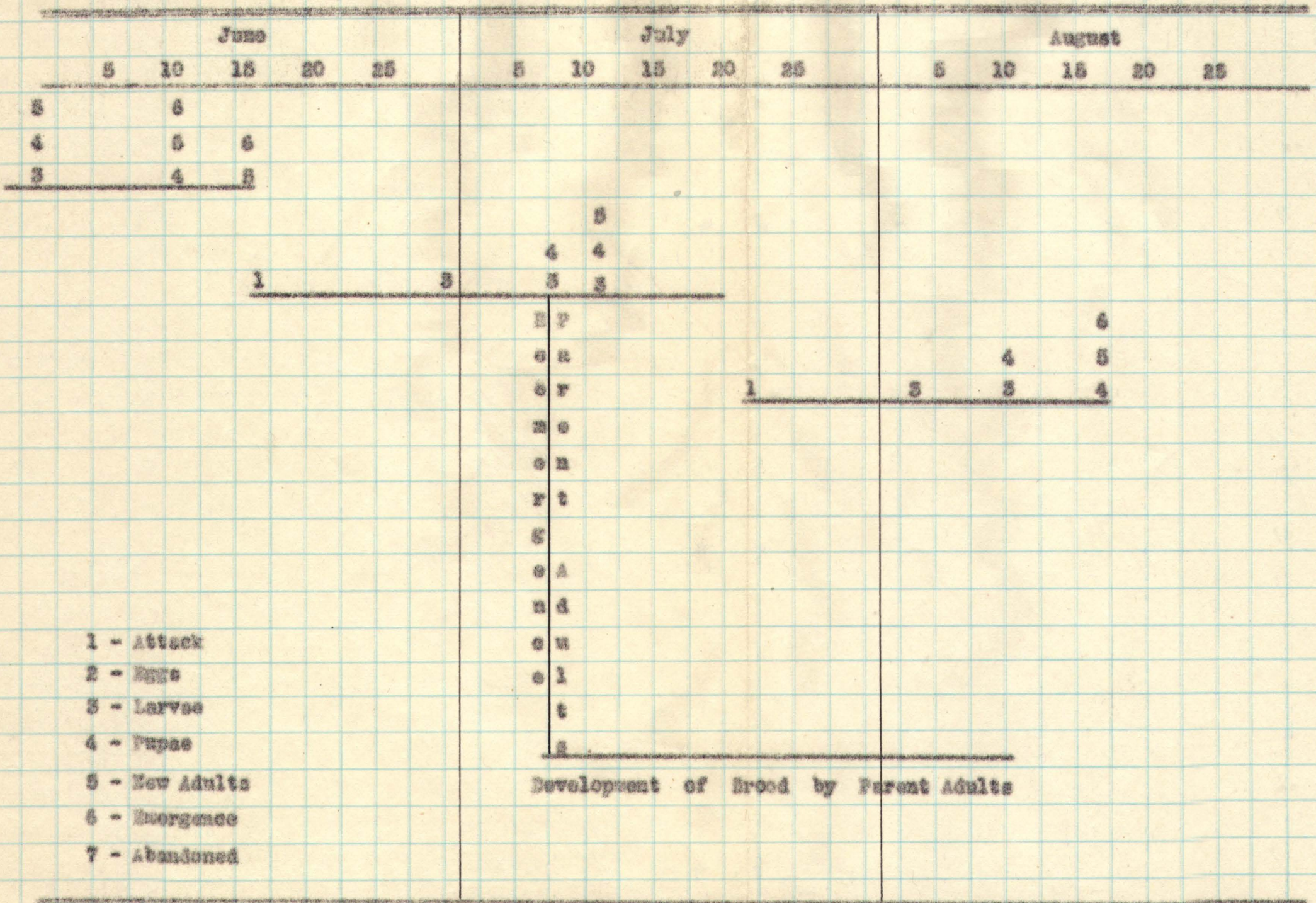

Figure 1

LIFE GRAPHS SHOWING THE DEVELOPMENT OF IPS CONFUSUS RECORDS IN TRAP TREES AT HUNTSPORK - 1932